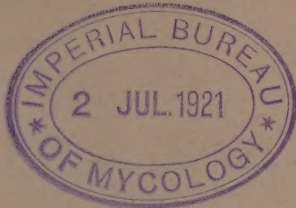


No. 63.



THE UNIVERSITY OF LEEDS
AND THE
YORKSHIRE COUNCIL FOR AGRICULTURAL
EDUCATION.

A REPORT
ON
EXPERIMENTS WITH POTATOES,
1906.

J. G. Stewart

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—
1907.

❧ COUNTY ❧ LECTURES. ❧

THE UNIVERSITY OF LEEDS, on behalf of the County Councils of the East, North and West Ridings of Yorkshire, will provide Courses of Instruction in the following subjects throughout the ensuing year:—

- I. Results of the Garforth and other experiments in the County.
- II. Agriculture.
- III. Horticulture.
- IV. Poultry Keeping.
- V. Farriery.

Application should be made as early as possible, to “The Clerks, Joint Agricultural Council,” addressed for the East Riding, to “The County Hall, Beverley”, for the North Riding, to “The County Offices, Northallerton”; and for the West Riding, to “The County Hall, Wakefield.”

Applications may also be addressed to “The Professor of Agriculture, The University, Leeds.”

The University of Leeds
AND THE
Yorkshire Council for Agricultural Education.

A REPORT
ON
EXPERIMENTS WITH POTATOES.
1906.

The experiments, other than manurial, conducted during 1906, are discussed under the following headings :—

1. The relative merits of a number of Varieties of Potatoes.
2. The relative merits of "Boxed" Seed and "Pied" Seed.
3. The effect of a local change of soil upon the productiveness of Potatoes.
4. The relative merits of seed raised in England, Scotland, and Ireland.
5. Immature *versus* Mature seed.
6. Scab on Potatoes.

1. THE RELATIVE MERITS OF A NUMBER OF
VARIETIES OF POTATOES.

(1) EARLY VARIETIES.

Trials of Early Varieties have been conducted for a number of years in the garden at the Manor Farm, Garforth, but not, hitherto, in the field. In 1905 seed of Harbinger, Recorder, and Sir John Llewelyn was planted on the farm to provide for a test on a larger scale in 1906. The seed of Harbinger and Recorder was obtained from English seedsmen; the seed of Sir John Llewelyn came from Scotland.

The test in 1906 was conducted in Field 31, the soil of which is a medium loam. The previous crop was barley grown after wheat. Whilst the land was being prepared for Potatoes lime was applied to the whole of the field at the rate of 1 ton per acre.

MANURIAL TREATMENT. The following manures were applied in the rows before planting:—

10 tons Dung per acre.

1 cwt. Sulphate of Ammonia per acre.

2 cwts. Superphosphate "

1 cwt. Muriate of Potash "

The cost of the artificials was 28s. 3d. per acre.

DATE OF PLANTING. The Potatoes were planted on April 23rd.

PARTICULARS REGARDING THE SEED. The seed used had been stored in boxes throughout the Winter, and at planting time the sprouts on Harbinger and Sir John Llewelyn were about $\frac{1}{2}$ in. long, and were very sturdy and uniform. On Recorder they were unequal in length, and varied from $\frac{1}{2}$ in. to $1\frac{1}{2}$ in. Whole tubers (seed size) were planted 12 in. apart in rows 28 in. wide.

The following notes were taken on June 23rd:—

"Harbinger. Low squat Variety with distinctive broad leaf; growth not very uniform, but the plants as a whole healthy-looking. Haulm about 5 in. high.

"Recorder. Haulm tall (about 10 in.), and robust. Flowers forming.

"Sir John Llewelyn. Not so robust as the last; haulm about 8 in. high. Flowers forming."

The Summer throughout was dry and the Potatoes ripened prematurely.

DATE OF LIFTING. The Varieties were not lifted until September 14th, by which date the tops of Harbinger and Recorder were quite dead. The tops of Sir John Llewelyn had still a tinge of green which indicates that this Variety cannot strictly be regarded as a First Early.

Each plot was $\frac{1}{40}$ acre in extent, but in the following table the yield is given per acre.

TABLE I.

VARIETY.	YIELD PER ACRE.			
	Ware.	Seed.	Chats.	TOTAL.
	Tons. cwt. qr.	Tons. cwt. qr.	Tons. cwt. qr.	Tons. cwt. qr.
Sir John Llewelyn	5 10 0	2 4 0	1 3 2	8 17 2
Recorder	4 15 3	2 2 3	1 12 2	8 11 0
Harbinger	1 14 0	1 6 2	0 16 2	3 17 0

Although "demic" (*Phytophthora*) was detected on the foliage on September 6th, the tubers when lifted were free from disease.

The climate at Garforth cannot be regarded as a suitable one for the growing of early potatoes, owing to the frequent occurrence of late Spring frosts, but it nevertheless seems desirable to conduct further tests, in the hope that a record of the crops produced may be of value to those whose conditions are suited to early Varieties. Accordingly, the Varieties in the following table were grown in 1906 from new seed, and they will again be grown in 1907, as the crops of the second year are the best guide as to the suitability of a variety for any particular district, especially when the seed has been brought from some considerable distance.

TABLE II.

VARIETY.	Source of Seed.	YIELD PER ACRE.		
		Ware and Seed.	Chats.	TOTAL.
		Tons. cwt. qr.	Tons. cwt. qr.	Tons. cwt. qr.
Midlothian Early ..	Dobbie Scot.	9 11 3	1 1 2	10 13 1
Harbinger	Sutton Eng.	6 10 3	2 9 1	9 0 0
Sir John Llewelyn ..	Poad „	7 4 3	1 3 2	8 8 1
Recorder	Dennis „	6 10 3	0 19 1	7 10 0
Ringleader	Sutton „	4 11 0	1 3 2	5 14 2
Dalmeny Early ..	Dalmeny Scot.	4 0 1	1 3 2	5 3 3

Area of each plot = $\frac{1}{120}$ acre.

The only variety in the above table that calls for special remark is Midlothian Early. On June 23rd, it was noted that this was decidedly the most promising Early in the field. The haulm was erect and spreading and remarkably uniform, and the flower buds were already conspicuous. Although the Varieties were all lifted about the same date, Midlothian Early was amongst the first to ripen, and as will be noted it gave the biggest yield.

Mr. Thomas Redington, Instructor in Horticulture, assisted with the cooking tests which were carried out with all the Varieties on January 5th, 1907. The following table gives particulars of the **Cooking Quality of the Early Varieties** as tested on that date:—

TABLE III.

VARIETY.	No. of times grown on Farm.	Colour. Maximum marks 15.	Flavour. Maximum marks 20.	Flouriness. Maximum marks 15.	TOTAL MARKS. Maximum 50.	REMARKS.
Recorder	twice	14	16	14	44	
„	once	14	16	14	44	
Harbinger.. ..	twice	12	16	13	41	
„	once	11	14	8	33	
Sir John Llewelyn	twice	8	14	10	32	} Dark in colour and pasty.
„ „	once	5	14	8	27	
Dalmeny Early ..	„	15	17	14	46	
Ringleader ..	„	13	16	12	41	
Midlothian Early	„	12	15	12	39	A trifle yellow.

It will be noted that those Varieties which have been grown twice on the farm have cooked rather better than the same Varieties grown from new seed.

(2) SECOND EARLY AND MAINCROP VARIETIES.

The following list of Varieties tested in 1906 includes those that have proved most profitable in previous trials, extending back to 1898, as well as several of the most recently introduced kinds:—

Second Earlies. British Queen, Dalmeny Acme, Royal Kidney, Stuntney King Cole, Stuntney Surprise.

Maincrop Varieties. Charles Fidler, Dalmeny Beauty, Dalmeny Regent, Discovery, Duchess of Cornwall, Eldorado, Empress Queen, Evergood, Factor, King Edward VII., Northern Star, Peacemaker, Up-to-Date and Wonder.

There was, as in previous years, a duplicate test in the County, and we are greatly indebted to Mr. J. Thompson, of East Rigton, Wetherby, for conducting the same in 1906.

PARTICULARS REGARDING THE SEED. Seed of all the Varieties included in the trials was obtained in the Spring of 1905, as far as possible from the raisers, and was grown at Garforth under the same manurial and soil conditions. The reason for growing the seed at Garforth before testing it in the County was to modify as far as possible the effects due to change of seed from different parts of the country, effects which might prevent reliable conclusions being arrived at as to the true merits of the Varieties. The Seed used at both centres had been stored in boxes at Garforth throughout the winter, and an idea of its condition at planting time at the two centres may be gathered from the following notes :—

East Rigton. “The following Varieties have just started to sprout, the sprouts being no more than tiny white specks :— Charles Fidler, Dalmeny Beauty, Duchess of Cornwall, Empress Queen, Evergood, King Edward VII., Northern Star, Up-to-date, and Wonder. British Queen has got well started, but the average length of the sprouts does not exceed $\frac{1}{8}$ inch.”

Garforth. “The Second Earlies have sprouts about $\frac{1}{2}$ in. long on the average. The sprouts of the Late Varieties vary from $\frac{1}{8}$ to $\frac{1}{4}$ in.”

Although, as a rule, disease does not manifest itself to any extent amongst potatoes stored in boxes, yet a good many “demics” had to be removed from boxes containing Dalmeny Beauty, Duchess of Cornwall, and Up-to-Date. There were fewer present in Factor, Northern Star, and Wonder, and the remaining Varieties were practically sound.

MANURIAL TREATMENT. At Garforth the manures used were the same as for the Early Varieties (see page 4). At East Rigton, where the soil is a strong-bodied loam, overlying Magnesian Limestone, the following manures were applied in the row before planting :—

10 tons (approx.) well-rotted Dung, per acre ; 6 cwts. per acre of a mixture made up of 2 parts Super, 1 part Sulphate of Ammonia, and 1 part Sulphate of Potash.

At East Rigton the previous crop was Oats after Peas. For particulars as to the previous cropping at Garforth (see page 4.) At both places whole potatoes were planted in rows 28 in. wide, the sets being 14 in. apart in the rows.

DATES OF PLANTING. The potatoes were planted at East Rigton on April 6th, and at Garforth on April 28th and 30th.

Notwithstanding the fact that the Varieties were all planted out of boxes and that little or no damage was done to the sprouts, the growth of many of the Varieties was slow and uneven. Doubtless the dry Spring and Summer were in a large measure responsible for this, and, whilst the result is that many Varieties have utterly failed to yield a profitable return, others have cropped satisfactorily and therefore may be regarded as reliable Varieties, even in a dry season.

The season of 1905 will be remembered as a dry one, but the following record of the rainfall at Garforth during the months when potatoes make their growth shows that there was still less rain in 1906 :—

	1905.	1906.
April	1·91 in.	0·78 in.
May	0·64 „	1·92 „
June	2·00 „	1·13 „
July	1·40 „	1·22 „
August	4·18 „	1·74 „
September	1·57 „	0·71 „
	<hr/> 11·70 in.	<hr/> 7·50 in.

DATES OF LIFTING. The potatoes were lifted at Garforth between September 29th and October 22nd, and at East Rigton on October 6th. For particulars of the yield, &c., at these two places, see Table IV., page 9.

Whilst the crops at Garforth are on the average heavier than those at East Rigton, there is a close agreement between the two centres with regard to the relative cropping merits of the Varieties.

It would almost seem that the Varieties from Evergood downwards might henceforth be eliminated from further trials as unreliable and unprofitable.

It is, however, only fair to state that Northern Star, Eldorado, Peacemaker and Discovery have not had precisely the same treatment as the other sorts. Owing to the extravagant prices that had to be paid for them, only very small quantities of seed were purchased in 1905, and the tubers were cut into as many sections as possible, whereas only an occasional tuber of the other Varieties was cut.

In 1906, of course, *whole* seed of each variety was planted.

Duchess of Cornwall, Factor, Dalmeny Beauty, Wonder and Dalmeny Regent are all of the Up-to-Date type, and it would appear that this is still the best type of potato for a farmer to grow, notwithstanding the unfortunate fact that it is comparatively liable to disease.

British Queen is still one of the best of the Second Earlies.

Stuntney King Cole and Stuntney Surprise are two Second Early Varieties, the seed of which was supplied by Mr. C. Ambrose, Stuntney Hall, Ely. Both are white-skinned potatoes. The King Cole is semi-round in shape, the Surprise is more like a Kidney. They are much alike in the character of the foliage. The sprouts are bluish-black in colour, and the tops maintain throughout the Summer an upright and vigorous dark green growth that mark them off as Varieties quite distinct from anything else in the field. They are deserving of further trial.

Royal Kidney and Dalmeny Acme are very similar in type. They are good disease-resisting Varieties but produce too big a percentage of small potatoes to be classed as profitable sorts.

The following table gives particulars of the yield, &c., at Garforth and East Rigton.

TABLE IV.

NAME OF VARIETY.	YIELD PER ACRE.					
	GARFORTH.			EAST RIGTON.		
	Total Crop per acre.	Per- centage of Ware.	Weight of Diseased Tubers per acre.	Total Crop per acre.	Per- centage of Ware.	Weight of Diseased Tubers per acre.
	Tons. cwt. qr.		Tons. cwt. qr.	Tons. cwt. qr.		Tons. cwt. qr.
Duchess of Cornwall	11 16 0	66	1 0 0	8 19 0	81	0 1 0
Factor	11 14 1	68	1 4 1	8 16 0	77	Nil
Royal Kidney ..	11 14 1	56	0 2 1	7 14 0	60	Nil
Dalmeny Beauty ..	11 11 0	63	0 10 3	8 14 3	82	Nil
Wonder	11 11 0	67	1 0 1	7 12 0	76	0 0 3
Dalmeny Acme ..	11 2 3	50	Nil	..	..	..
British Queen ..	10 18 2	57	Trace	8 7 1	78	Trace
Up-to-Date.. ..	10 15 3	64	1 8 1	8 2 3	70	Nil
Dalmeny Regent ..	10 7 1	63	1 1 3	..	..	..
Stuntney Surprise	9 8 1	59	Nil	..	..	..
„ King Cole	9 7 3	59	Nil	..	..	..
Evergood	8 14 1	59	Nil	6 12 2	48	Nil
Northern Star ..	7 16 0	48	0 0 2	5 1 0	43	Nil
Discovery	7 0 1	71	Nil	..	..	..
Empress Queen ..	6 16 3	75	Nil	5 11 3	69	Nil
King Edward VII.	5 0 3	67	Nil	3 3 2	56	Nil
Charles Fidler ..	3 10 1	59	0 1 0	3 10 3	73	Nil
Eldorado	1 18 2	30	Trace	..	..	..
Peacemaker ..	1 12 1	56	Nil	..	..	..

Whilst a number of Varieties have at Garforth yielded a total crop of 11 tons per acre, yet the column giving the percentage of ware shows that about three-fifths only of this yield were saleable for cooking purposes.

A big percentage of small potatoes was a noteworthy feature in many of the crops of 1906.

New seed of some of the best cropping Varieties in the above Table, and of some others recently introduced was also planted in the same field, but on rather heavier land. A portion ($\frac{1}{120}$ th acre) of each was weighed and the yields per acre are given below :—

TABLE V.

VARIETY.	Source of Seed.	Total Crop per acre.	Per- centage of Ware.	Weight of Diseased Tubers per acre.
		Tons. cwt. qr.		Tons. cwt. qr.
Northern Star ..	Poad Yorks.	16 9 0	63	Nil
Up-to-date ..	Findlay Scot.	16 4 3	55	1 7 3
Duchess of Cornwall	Kerr „	16 3 2	61	1 1 2
Dalmeny Regent ..	Dalmeny „	14 10 1	65	0 11 3
Factor	Dobbie „	14 8 1	62	0 16 0
British Queen II. ..	Findlay „	13 17 2	59	Nil
Dalmeny Radium ..	Dalmeny „	12 8 2	50	Nil
King Edward VII...	Butler Lincs.	12 7 2	63	Nil
Royal Kidney ..	Findlay Scot.	12 0 0	52	Nil
British Queen ..	„ „	10 6 3	51	Nil
Wonder	East Riding ..	9 17 1	71	0 18 1
Eldorado	Findlay Scot.	9 16 1	41	Nil
Discovery	Sutton Eng.	5 4 1	64	Nil
Eldorado	East Riding ..	1 9 3	57	Nil

As already explained, Northern Star had never, prior to 1906, been tested on terms of strict equality with the other sorts, and judging from the result of the test in 1906, it would seem that further trials of this well-known and frequently much maligned Variety are necessary before adverse conclusions as to its cropping powers are justifiable.

Northern Star has been tested at Garforth during the past five years, and each year the Crop has contained several dissimilar plants, particularly in the case of seed grown more than once at Garforth. The Yorkshire firm that supplied the Northern Star used in the test of 1906, gave the assurance that the seed had been grown in Yorkshire from the best selected type of Findlay's Variety. The character of the crop to be grown at Garforth in 1907 with seed secured from the above crop will be watched with interest.

Another Variety that deserves special notice is British Queen II. Its appearance was very promising throughout the summer, and although its resemblance to British Queen was quite noticeable, it seemed to possess considerably more vigour, and, as will be seen, it has given a much better crop.

Dalmeny Radium is a Second Early of the British Queen type.

COOKING QUALITY OF THE SECOND-EARLY, AND MAIN
CROP VARIETIES.

In the following table, particulars are given of the cooking quality of Varieties grown, with the exception of Eldorado, for the second time at Garforth. Eldorado has been grown three times without change of seed:—

TABLE VI.

VARIETY.	Colour. Maxi- mum Marks 15.	Flavour. Maxi- mum Marks 20.	Flouri- ness. Maxi- mum Marks 15.	Total Marks. Maxi- mum 50.	REMARKS.
Conquest	14	19	14	47	Very good
Dalmeny Beauty ..	14	19	14	47	„
Duchess of Cornwall	15	18	14	47	„
British Queen ..	13	19	14	46	„
Peacemaker	14	20	12	46	Fine flavour
Wonder	14	18	14	46	Good all round
King Edward VII...	13	18	13	44	
Northern Star ..	13	18	13	44	
Stuntney Surprise ..	13	17	14	44	
Up-to-Date	14	16	14	44	
Charles Fidler ..	12	18	12	42	
Dalmeny Regent ..	13	18	10	41	
Factor	12	16	12	40	
Stuntney King Cole	12	16	12	40	
Empress Queen ..	8	17	10	35	Dark in colour and wet
Discovery	12	10	12	34	Flavour bad
Royal Kidney ..	6	17	11	34	Dark in colour and soapy
Eldorado	8	14	9	31	„ „
Evergood	6	14	8	28	„ „
Dalmeny Acme ..	5	10	5	20	Appearance resembling an Artichoke

Comparative freedom from disease is a noteworthy feature in the crops grown from the new seed.

Conquest, although a potato of good quality, is too moderate a cropper and too liable to disease to be classed as a profitable sort to grow.

Dalmeny Beauty and Duchess of Cornwall, both of the Up-to-Date type, are of very good cooking quality and may also be depended upon to crop satisfactorily.

From Empress Queen, downwards, the Varieties are of distinctly inferior quality.

In the next table particulars are given of the COOKING QUALITY of Varieties grown from *new* seed, on heavy land :—

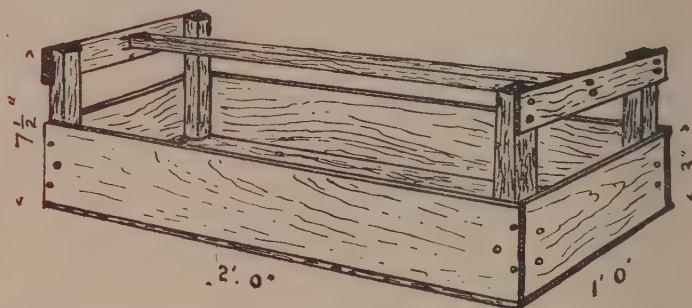
TABLE VII.

VARIETY.	Colour. Maxi- mum Marks 15.	Flavour. Maxi- mum Marks 20	Flouri- ness. Maxi- mum Marks 15.	TOTAL MARKS. Maxi- mum 50.	REMARKS.
Dalmeny Radium ..	14	20	14	48	Excellent potato
Duchess of Cornwall	15	18	14	47	
Wonder	14	18	14	46	
Factor	14	16	14	44	
Superlative	13	17	14	44	
British Queen ..	13	18	12	43	
British Queen II. ..	13	17	13	43	
King Edward VII...	12	17	13	42	
Dalmeny Regent ..	12	16	12	40	
Royal Kidney ..	10	16	10	36	Dark in colour and wet
Northern Star ! ..	9	14	7	30	„ „

Excepting Royal Kidney and Northern Star all the Varieties have cooked satisfactorily, Dalmeny Radium in particular being of excellent quality.

2. THE RELATIVE MERITS OF "BOXED" SEED AND "PIED" SEED.

The illustration is that of a box in which seed Potatoes may be conveniently stored in winter, or as soon as sprouting commences in spring. The box is provided with a handle, and the Potatoes can thus be planted from the box direct by a man or boy. The box costs $4\frac{1}{2}$ d., and it will hold about 20 lb.



Full particulars regarding past Experiments on the boxing of Potatoes will be found in Report No. 55. The main conclusion drawn from these Experiments was that where early planting of Second Early and Late Varieties was not possible boxing would be followed by profitable results.

The system was further tested in 1906, with the following results:—

TABLE VIII.

VARIETY.	Age of Seed.	GARFORTH.			EAST RIGTON.			GAR- FORTH.			EAST RIGTON.		
		Seed Boxed.	Seed Planted direct from Pie.		Seed Boxed.	Seed Planted direct from Pie.		Ad- vantage + Disad- vantage - of Boxing.			Ad- vantage + Disad- vantage - of Boxing.		
Royal Kidney ..	2nd year	11 14 1	10 12		17 14 0	7 17 2		+1 2 0			-0 3 2		
Up-to-Date ..	3rd „	11 2 1	11 6 0		..	..		-0 3 3			..		
British Queen ..	3rd „	9 1 3	8 6 2		..	..		+0 15 1			..		
King Edward VII.	3rd „	4 17 1	4 14 1		..	..		+0 3 0			..		
Factor ..	2nd „	..	..		8 16 0	9 18 1		..			-1 2		
Evergood ..	2nd „	..	..		6 12 2	5 10 1		..			+1 2		
British Queen ..	2nd „	..	..		8 7 1	8 13 2		..			-0 6		

Before considering the figures in the table it is well to mention that the quantities of seed pied were very small. Straw divisions separated each sort in the pie, and as the ridge was covered only with straw throughout the Winter the pie was kept well ventilated. As a consequence sprouting had only just commenced when the soil was removed from the sides of the pie in Spring, and even by the end of April, when the Potatoes were planted at Garforth, there was an entire absence of long tender white sprouts such as are often found in pies of the usual size and make. Moreover, the tubers were carefully transferred to boxes before planting, and practically no damage was done to the sprouts, either then or subsequently.

As planting at **East Rigton** was done early, viz., on April 6th, the pied seed formed its first sprouts *in the soil*, and was probably therefore in a condition to yield as good crops as the boxed seed. No advantage followed the use of boxed seed at this centre, except in the case of Evergood. This Variety, however, is very erratic in growth, and little reliance can be placed on the results from it.

At **Garforth**, where the Potatoes were planted later—April 28th and 30th—good results with the Second Early sorts, have, as in previous trials, followed the use of boxed seed. Up-to-Date has derived no benefit from boxing, and this also is more or less in keeping with former tests with this Variety.

3. THE EFFECT OF A LOCAL CHANGE OF SOIL UPON THE PRODUCTIVENESS OF SEED.

(1) A CHANGE OF SOIL ON THE SAME FARM.

The importance of frequent changes of seed from a distance—notably from Scotland—has been emphasised in all previous Reports dealing with Potato Experiments, but hitherto the effects of a strictly local change have not been definitely tested at Garforth.

The Varieties that appear in the table below were all grown at Garforth in 1905 in the same field and received the same manurial treatment. Part of the field (No. 36), however, is a medium loam, and part is strong clay. The rows of each Variety participated in both kinds of soil and for a test in 1906 seed was secured from the loamy portion and from the clay portion. In 1906 the potatoes were all planted on loamy soil and received the same manurial treatment. The following are the results :—

TABLE IX.

VARIETY.	SEED OFF LOAMY SOIL.		SEED OFF HEAVY SOIL.		Advantage in favour of Loamy Soil.
	Total Crop per acre.	Weight of Diseased Tubers per acre.	Total Crop per acre.	Weight of Diseased Tubers per acre.	
Royal Kidney	Tons. cwt. qr. 12 10 0	Tons. cwt. qr. Nil	Tons. cwt. qr. 11 14 1	Tons. cwt. qr. 0 2 1	Tons. cwt. qr. 0 15 3
Conquest ..	8 16 1	0 11 3	8 2 1	0 11 3	0 14 0
Charles Fidler	3 7 3	0 2 2	3 10 1	0 1 0	No advantage

Royal Kidney and Conquest show advantages in favour of the seed from the loamy soil, and this is in keeping with the appearance of the plots throughout the Summer. In the case of Charles Fidler the crops are so poor as to be unreliable for purposes of comparison.

It would appear, therefore, that nothing is to be gained by growing the potatoes one year on heavy, and the next year on loamy soil.

(2) A CHANGE FROM ANOTHER PART OF THE SAME COUNTY.

In 1905 the duplicate test of Varieties was carried out on Lord Wenlock's Home Farm at Esrcick, where the soil is a fine sand of fair body. Seed of the four Varieties occurring in the table below was secured from the Esrcick plots and grown at Garforth in 1906, alongside seed that had been grown at Garforth in 1905. The stock of both the Garforth and Esrcick seed was grown first at Garforth in 1904.

TABLE X.

VARIETY.	GARFORTH, 1904. " 1905. " 1906.			GARFORTH, 1904. ESCRICK, 1905. GARFORTH, 1906.			Advantage+ Disad- vantage- with change from East Riding.
	Total Crop per acre.	Weight of Diseased Tubers per acre.		Total Crop per acre.	Weight of Diseased Tubers per acre.		
	Tons. cwt. qr.	Tons. cwt. qr.		Tons. cwt. qr.	Tons. cwt. qr.		Tons. cwt. qr.
Up-to-Date ..	11 2 1	1 7 0		10 17 2	1 5 3		-0 4 3
British Queen ..	9 1 3	0 2 2		9 5 0	0 1 3		+0 3 1
Royal Kidney	7 18 2	Nil		10 1 3	Trace		+2 3 1
KingEdwardVII.	4 17 1	Nil		4 17 3	Nil		+0 0 2

With the exception of Up-to-Date, the Varieties have benefited as a result of the change to Esrcick, although in two cases the gain is so slight as to be practically negligible.

The results of this experiment do not give promise of much benefit arising from an interchange of seed between farmers on loamy soils and farmers on sandy soils in Yorkshire, but it is hoped in 1907 to determine the effect of a change from magnesian limestone to loam at Garforth.

4. THE RELATIVE MERITS OF SEED RAISED IN ENGLAND, SCOTLAND, AND IRELAND.

At the request of the Department of Agriculture for Ireland, a test was instituted at Garforth between English, Scotch, and Irish seed.

The Department supplied the Irish seed. Of the Scotch seed Up-to-Date and British Queen came from Mr. Findlay, Fifeshire, and Ninetyfold from Mr. Scarlett, Edinburgh.

Of the Varieties representing England, Up-to-Date and British Queen came from Scotland in the Spring of 1905, and consequently had been grown only one year in England. The Ninetyfold was grown first at Garforth in 1905 from seed sent from Rothamsted.

The following table gives particulars of the yields, &c. :—

TABLE XI.

VARIETY.	ENGLAND.			SCOTLAND.		
	Total Crop per acre.	Per- centage of Ware.	Weight of Diseased Tubers per acre.	Total Crop per acre.	Per- centage of Ware.	Weight of Diseased Tubers per acre.
	Tons. cwt. qr.		Tons. cwt. qr.	Tons. cwt. qr.		Tons. cwt. qr.
Ninetyfold	7 11 0	53	0 4 3	10 3 2	55	0 1 0
British Queen	10 18 2	57	Trace	10 18 3	33	0 5 3
Up-to-Date ..	10 15 3	64	1 8 1	13 9 0	57	0 16 2

VARIETY.	IRELAND.		
	Total Crop per acre.	Per- centage of Ware.	Weight of Diseased Tubers per acre.
	Tons. cwt. qr.		Tons. cwt. qr.
Ninetyfold ..	9 16 2	50	Nil
British Queen ..	12 12 3	36	0 2 3
Up-to-Date ..	13 6 3	63	0 16 0

In every case the **English** seed has given the smallest yields, and, on the whole, the greatest amount of diseased tubers.

The percentage of ware or cooking Potatoes, however, is the most satisfactory of the three.

With two Varieties, **Scotch** seed has given bigger total crops than **Irish** seed, but the gain is only slight, and is practically discounted by the much bigger yield obtained from Irish British Queen than from Scotch British Queen. The amount of disease present in the crops from Irish seed was somewhat less than in those from Scotch seed.

With both Irish and Scotch seed the percentage of cooking Potatoes was disappointingly small.

It was noted from time to time throughout the summer that the haulm of the Irish seed was the tallest and most robust, whilst that of the English seed was decidedly the shortest and weakest.

COOKING QUALITY.

TABLE XII.

	Colour. Maximum Marks=15.	Flavour. Maximum Marks=20.	Flouriness. Maximum Marks=15.	TOTAL MARKS. Maximum =50.
Ninetyfold (England) ..	12	18	14	44
„ (Scotland) ..	11	15	10	36
„ (Ireland) ..	13	17	12	41
British Queen (England)	13	19	14	46
„ (Scotland)	13	18	13	44
„ (Ireland) ..	13	18	13	44
Up-to-Date (England) ..	14	16	14	44
„ (Scotland) ..	13	18	14	45
„ (Ireland) ..	13	17	12	42

There are no marked differences in cooking quality between the English, Scotch, and Irish seed, although, on the whole, the English seed has proved the best.

5. IMMATURE *versus* MATURE SEED.

Potatoes when lifted in comparatively late districts, *e.g.*, many parts of Scotland, have probably not reached the size they can attain to in milder and earlier districts.

Assuming then that the crop in the later district contains the smaller amount of ware or cooking Potatoes, it will contain a greater proportion of seed-size Potatoes; and it may be that such seed will have more innate vigour than seed of a like size from a crop grown in a climate that favours the production of a bigger proportion of ware, for in the latter case the amount of stunted weakly tubers will be proportionately greater than in the former. This may explain to some extent why Scotch seed does so well in England.

To obtain seed in an **immature** state, small quantities of Royal Kidney and Dalmeny Beauty were lifted on September 23rd, 1905, when the tops were still green and the skin of the tubers tender.

To get **mature** seed the remainder of the same Varieties was lifted on October 16th and 18th respectively, when the tops had died down, and the skin of the tubers had become tough.

By lifting the crop early a considerably smaller crop has naturally been obtained, as the following weights show :—

	Mature. Lifted, Oct. 16th-18th.				Immature. Lifted, Sept. 23rd.		
	Tons. cwt. qrs.				Tons. cwt. qrs.		
Royal Kidney	13 2 1	...	...	8 17 2		
Dalmeny Beauty	...	10 18 2	...	...	9 14 3		

The mature and immature seed thus obtained were stored in boxes throughout the Winter. Small quantities of the mature and immature seed of Royal Kidney were also pied. In Spring the condition of the immature seed, both in the boxes and in the pies was quite as good as that of the mature seed, at any rate as far as could be judged by the appearance of the tubers. The following table supplies particulars of the crops obtained from the seed treated in the above ways :—

TABLE XIII.

VARIETY.	YIELD PER ACRE.					
	Mature Seed.			Immature Seed.		
	Tons.	cwt.	qr.	Tons.	cwt.	qr.
Royal Kidney, seed "boxed" ..	12	10	0	11	5	3
" " seed "pied" ..	10	12	1	9	2	1
Dalmeny Beauty, seed "boxed" ..	11	11	0	11	14	0

The use of immature seed both boxed and pied has, in the case of Royal Kidney, resulted in a reduced yield. In the case of Dalmeny Beauty the advantage from immature seed is practically negligible, so that it seems nothing is to be gained by planting immature seed obtained in the way described. Both these Varieties have been grown only twice on the farm, new seed having been procured from Scotland in 1905. It is of interest to note that whilst little or no advantage was obtained in a similar experiment last year with similar new seed, an average gain of 24 cwts. per acre was got from immature seed of Royal Kidney and British Queen that had been grown one year longer on the farm.

The nugatory results obtained in 1906 with comparatively new seed may be attributable to the fact that the mature seed was largely the produce of strong robust plants, and that it had grown no bigger simply on account of the tubers having been formed late in the season. The longer the same stock of seed is used the greater is the tendency of the crop to contain weakly plants.

Perhaps a better test of the value of *immature* seed is the following :—

In 1905 seed of Charles Fidler, Wonder, and Up-to-Date was planted about the usual time and then again part of the same stock of seed was planted late in June.

The plots were lifted on October 18th and 19th, 1905, and the following were the yields per acre, &c.

Variety.		Date of Planting.		Yield per Acre.		
				Tons.	cwt.	qr.
Charles Fidler	...	May 16th	...	6	19	1
"	"	June 24th	...	4	2	2
Wonder	...	May 16th	...	11	13	2
"	...	June 24th	...	6	15	0
Up-to-Date	...	May 17th	...	10	5	3
"	...	June 20th	...	6	9	3

The two Varieties Charles Fidler and Wonder had now been grown four times on the farm without change of seed, and Up-to-Date three times, so that they were more likely to contain weakly plants than the comparatively new seed referred to in Table XIII.

On account of frost and other influences, the tops of the late planted Potatoes were quite dead at lifting time, and they in no way retarded the lifting operations. The late planting naturally resulted in greatly reduced yields, but the tubers, for the most part "seed size" and "small" were in excellent condition, and their skins were quite tough enough to resist rubbing.

Both the mature and immature seed obtained in this way, were treated exactly alike throughout the winter, being stored in boxes, and they were planted under the same conditions on April 28th, 1906.

The following are the results :—

TABLE XIV.

VARIETY.	YIELD PER ACRE.								Advantage+ Disadvantage - with Immature Seed.									
	Mature Seed.						Immature Seed.											
	Whole Sets.			Cut Sets.			Whole Sets.			Cut Sets.			Whole Sets.		Cut Sets.			
	Tons.	cwt.	qr.	Tons.	cwt.	qr.	Tons.	cwt.	qr.	Tons.	cwt.	qr.	Tons.	cwt.	qr.	Tons.	cwt.	qr.
Charles Fidler	6	5	1	6	19	1	6	0	0	6	14	0	-0	5	1	-0	5	1
Wonder ..	10	5	3	9	12	3	11	11	0	11	0	3	+1	5	1	+1	8	0
Up-to-Date ..	9	13	1	10	5	3	10	12	3	9	9	3	+0	19	2	-0	16	0

The only variety that has shown any marked advantage from the use of immature seed is Wonder, and it has been grown in Yorkshire continuously for the last ten years at least.

The other two were introduced on to the farm—Up-to-date from Scotland, and Charles Fidler from the South of England.

Judging from these results, it is questionable whether a farmer would be well advised in trying to restore vigour to his Potatoes by growing immature seed, when by frequently introducing suitable changes of seed he is practically certain of reaping distinct advantages.

6. SCAB ON POTATOES.

Potatoes are frequently disfigured by the presence on the skin of rough brown excrescences, known generally as scab. Its occurrence in Yorkshire is confined chiefly to sharp sand and gravel soils, and the disease may be so severe as completely to cover the entire skin of the tuber and even penetrate into the flesh. In such extreme cases the Potatoes are quite unmarketable, and the presence of even a few blotches of scab adversely affects the sale. On heavy soils in Yorkshire the disease is practically unknown.

There is much uncertainty as to the cause of scab. It has been attributed to small incisions made by sharp stones, cinders, &c., with which the tubers come in contact in the process of swelling. Scab, however, is frequently found on soils where such sharp-edged substances are not present.

It has been proved that certain Varieties are more scab-resisting than others, and the choice of a suitable Variety may solve the difficulty on soils where scab is not usually severe. Among scab-resisting Varieties may be included Charles Fidler, Discovery, Evergood, King Edward VII., Royal Kidney, Northern Star, and, to a less extent, British Queen. The Potatoes most liable to scab are those of the Up-to-Date type.

There are, however, soils on which practically no Variety can be grown free from the malady.

With a view further to investigate the disease, and if possible provide a remedy, a number of experiments have been conducted. Applications of lime, sulphur (in the form of a sulphurous shale), and salt, have not had the effect of checking scab on soil that is badly infested with it. It is, indeed, often stated that lime causes the disease, or at any rate increases its virulence, but such has not been the case at Garforth, where it was applied in fine powder (air-slaked), at the rate of three tons per acre, and was worked into the drill over the sets. Flowers of sulphur have been used by gardeners, it is said, with some success. Dressings of salt or kainit (which contains 30 % of salt) have checked scab on soils where the tubers are attacked only to a small extent (Report No. 55.)

Whatever the cause of scab may be, it would seem that there is some relationship between the virulence of the disease and the moisture-holding capacity of the soil.

It has been noted that scab is much more prevalent in a dry than in a wet season. Again, soils that are naturally retentive of moisture, such as heavy or peaty soils, will grow Potatoes practically free from scab. On a plot of poor, thin soil in the garden at Garforth scabby Potatoes were grown in 1905 from clean seed. In the following Winter this plot was "bastard-trenched," that is, the subsoil was loosened with a graip but not brought to the surface or at all mixed with the surface soil. In 1906 Potatoes were again grown on this plot, and there was not the slightest trace of scab on them. The plot, by the trenching, was put in a better condition for holding moisture.

In 1906 an experiment was conducted on Mr. F. Wood's farm at Ellerker, in a field the soil of which is a poor, dry sharp sand inclined to blow at times. Mr. Wood, who conducts a market-gardening business, had to cease growing Potatoes on this field on account of the extent to which scab attacked the tubers.

Salt has been used with some success in the Ellerker district with the object of checking scab, but on this particular field its use was attended with no practical benefit. It has the power of attracting moisture from the air and thus of keeping the soil more or less moist, so that any advantages obtained from its use may be attributable to that property.

The Experiment at Ellerker, conducted with substances that for the most part would tend to increase the water-holding capacity of the soil, was as follows :—

Plot 1.	10 cwt.	Shoddy		per acre.
Plot 2.	10 "	" "	and 5 cwt. Salt	"
Plot 3.	20 "	Peat Moss Litter		"
Plot 4.	20 "	" "	" and 5 cwt. Salt	"
Plot 5.		Untreated		
Plot 6.	53 cwt.	Sawdust		"
Plot 7.	53 "	" "	and 5 cwt. Salt	"
Plot 8.	10 "	Rape Meal		"
Plot 9.	10 "	" "	" and 5 cwt. Salt	"

All the Plots received a dressing—approximately 8 tons per acre—of well-rotted farmyard manure in the rows, on the day the potatoes were planted.

Five Varieties, viz., Conquest, Discovery, Up-to-Date, Charles Fidler, and British Queen, were planted on each Plot on May 22nd, whole seed free from scab being used in each case.

The quantities of peat moss litter and sawdust used were of equal money value. After being thoroughly soaked with water, they were distributed over the sets, and the drills were then split. Where salt was used it was spread on the top of the other substance.

The Potatoes on the salted plots were distinctly slower in appearing through the ground, and throughout the greater part of the summer they lagged behind the unsalted plots.

All the plots were lifted on October 24th, and with the exception of Up-to-date the Varieties yielded poor crops.

On the untreated plot all the Varieties were badly scabbed, some indeed more than others, but the produce of all was quite unsaleable for cooking purposes. Up-to-date was the worst affected, the tubers being completely scabbed over.

All the Varieties on the shoddy and rape meal plots, both with and without salt, were as much affected with scab as the same Varieties on the untreated plot. Even on a small piece where shoddy was applied at the rate of two tons per acre, there was no apparent diminution of scab. The tubers in the peat moss plot, and also on the plot which received salt in addition to peat moss, were considerably less affected with scab than those on the untreated plot, but still they were far from clean. On a small piece where peat moss was applied in the dry condition, no benefit whatever was derived, and the peat moss was dug up as dry as when applied.

There was a marked improvement on the plots dressed with sawdust, especially on the plot which also received salt, the bulk of the tubers here being practically free from scab.

On one row which got 53 cwt. wet peat moss and 5 cwt. salt per acre, the result was as good as with sawdust.

Considering the light nature of the soil and the remarkably dry season, the result with sawdust must be regarded as highly satisfactory. Where the sawdust had retained its moisture the tubers were absolutely clean, but where it had become dry, scab was present.

SUMMARY.

The following are the main conclusions drawn from the Experiments:—

I. Taking into account yield, cooking quality, and power of resisting disease, the following Varieties are well suited to cultivation in Yorkshire:—

Earlies. Recorder, Midlothian Early.

Second Earlies. British Queen, British Queen II., Dalmeny Radium.

Main Crop Varieties. Duchess of Cornwall, Factor, Dalmeny Beauty, Dalmeny Regent, Wonder, Up-to-Date. All these are of the Up-to-Date type.

II. Where potatoes can be planted before much sprouting has taken place, boxing of seed need not be resorted to.

III. The vigour of the Potato has not been maintained by growing alternately on different kinds of soil on the Manor Farm, Garforth. Further experiments, however, on this point are necessary.

IV. A change from a distant part of the same County was slightly beneficial.

V. Seed from Scotland and Ireland yielded crops distinctly superior to that produced by English seed.

On the whole the Irish seed was as good as the Scotch.

VI. The use of immature seed has not on the whole been profitable.

VII. A dressing of wet sawdust applied over the sets at planting time proved distinctly beneficial in checking Potato scab on land where the disease was very prevalent.

Where salt was applied in addition to sawdust the tubers were practically clean.

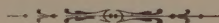
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THE UNIVERSITY, LEEDS,
January 7th, 1907.

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